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ORIGINAL ARTICLE

Intergenerational income mobility in Sweden: A look at the spatial disparities across municipalities

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Abstract

This paper provides a comprehensive overview of intergenerational income mobility in Sweden. Intergenerational income mobility is considered in both relative and absolute terms, and the analysis is carried out at the individual and municipality level. We use multilevel models to explore the correlation between upward mobility and social, economic and demographic characteristics of cities. We account for a wider set of local characteristics, such as the spatial distribution of income inequality within city and housing affordability that have not been considered by previous studies analysing social mobility in the United States or other European countries.

The analyses are carried out on three subpopulations: offspring who live in a different municipality than their parents (spatial mobile population); offspring who live in the municipality where they grew up (spatial immobile population); offspring belonging to visible minority groups.

Our results show substantial differences across municipalities, meaning that the particular combination of municipality attributes contributes to shaping the chance of status attainment among young generations. Highly mobile municipalities have more significant human capital, more residential segregation by income, more local levels of income inequality, and greater accessibility to jobs. The results indicate that dependence on parents' support and network for upward mobility is of less importance, and that spatial mobility (regardless of background) especially to larger urban areas is associated with upward mobility for the children.

KEYWORDS
individual analysis, intergenerational social mobility, multilevel models, municipalities, Sweden

JEL CLASSIFICATION
J62; R11; R12

1 | INTRODUCTION

Intergenerational social mobility is a widely accepted measure of the relationship between the socioeconomic status of parents and their children. It has been examined in detail for different countries and by cross-country comparisons. The majority of these studies compute the stickiness of intergenerational links in terms of income, occupation or education by either parametric or non-parametric approaches. Previous literature offers an extensive empirical investigation of social mobility, and starting from early contributions, the degree of social mobility is considered as a measure of countries' openness (Blau & Duncan, 1967; Erickson & Goldthorpe, 1992). In socially mobile or open societies, status attainment is independent of the social origin, and advantages or disadvantages are not passed on to the next generation (Hout, 1988).

Family background affects the opportunities of offspring through well-known channels such as financial constraints, investments in education and skills (Becker & Tomes, 1979, 1986). At the country scale, social mobility is often attributed to a set of factors including economic development, industrialization, institutions and, in particular, the accessibility of education and related policies (Schütz, Ursprung, & Wößmann, 2008). Most of the previous studies offer social mobility measures either from a comparative perspective across countries or temporal changes in the same country, for instance, to track evaluation of distributive policies. Recently, few works have investigated the heterogeneity in social mobility within countries, across administrative units. The most notable works in this respect include Chetty's contributions on the United States, where social mobility is shown to differ significantly within the country and among the geographical areas defined as commuting zones or counties (Chetty & Hendren, 2018a, 2018b; Chetty, Hendren, & Katz, 2016; Chetty, Hendren, Kline, & Saez, 2014). It should be noted, however, that the US counties – as the scale of geography – might represent entities too large to predict the relationship between underlying social mobility mechanisms and contextual effects. For instance, Galster et al. (2016) show that the influence the smallest environments are most pronounced for income from work in Sweden. In this paper, we study how the place where the invidual lives affects social mobility in Sweden using fine-gridded geography and individual-level information. In particular, we focus our attention on whether migration away from the urban area of parents is associated with upward social mobility after controlling neighbourhood characteristics and urban qualities.

Chetty, Hendren, Kline and Saez (2014) point out two advantages of focusing on within-county comparisons as opposed to cross-country comparisons. Cross-country comparisons often suffer from differences in methods and measurements, which might be overcome by a unified method within a country. The second advantage is that within-country comparisons allow study of both relative and absolute measures of social mobility; such investigation would necessarily be confined to a single focus on relative mobility in cross-country comparisons owing to the lack of a common absolute scale (Chetty, Hendren, Kline, & Saez, 2014; Ray, 2010). Following the recent literature, the present paper offers an empirical investigation of social mobility within Sweden, with particular attention on the spatial factors correlated with the observed heterogeneity in social mobility among Swedish municipalities.

Sweden is among the countries for which several studies examined social mobility dynamics and patterns for different periods. The common result is that intergenerational social mobility is relatively high in Sweden in comparison with other European countries and the United States (Björklund & Jäntti, 1997; Corak, 2006; D'Addio, 2007). Recently, Heidrich (2017) looked at the intergenerational income mobility within the country considering the variation in the local labour market as the unit of the analysis, where the local labour market is an aggregation of municipalities defined by commuting patterns. Heidrich (2017) identified large regional differences, particularly in absolute outcomes. The change of geographical focus from country comparisons to the study of smaller spatial units makes sense considering that intergenerational social mobility of a child is affected not only by macro-conditions on a national level or on a micro-level considering parents or home of upbringing but also by the conditions in the local neighbourhood and the urban area in which housing conditions, school qualities, etc. play a vital role. Several studies have investigated the role of neighbourhoods and smaller communities for social mobility with special attention to socioeconomic characteristics, local networks and structural functionality (see for instance Galster & Killen, 1995; Galster, 2001). In Sweden, Bergsten (2010), studied the role of childhood sociodemographic composition at neighbourhood level for educational and employment outcome in adulthood. The results of Bergsten's study indicated that neighbourhoods play a vital role for determining future choices and outcomes of the local children. Children's exposure to poverty and the long-term effects on the children's future opportunities, and the long-term effects of sociodemographic status of neighbourhoods has been the focus of Van Ham, Hedman, Manley, Coulter and Östh (2014) and Hedman, Manley, Van Ham and Östh (2015). Both of these studies emphasize neighbourhood effects, and particularly point to the observed disadvantage of belonging to an ethnic minority (see also Türk & Östh, 2019).

The role of migration for upward social mobility has been the focus of several papers, especially with attention to the effects of the move-to-opportunity experiment where randomly selected families were given opportunities to relocate from high to low poverty areas in the same urban region (see, for instance, Clampet-Lundquist & Massey, 2008; Chetty, Hendren, & Katz, 2016). Due to the experimental design of the move-to-opportunity program, relocated and non-relocated children could be compared in terms of social mobility in early adulthood. The considered migration in these studies were events that took place during child years; however, the most common migration event is when young adults move from home. In Sweden, the majority of young-adult migration events are oriented towards the larger urban areas or university towns (see, for instance, Niedomysl, 2008; Mulder, Lundholm, & Malmberg, 2020), but the propensity to migrate is also related to strength of ties to the local community, which includes family relationships, place connectedness, etc. (Fischer & Malmberg, 2001).

This offers us an opportunity to compare how social mobility is, on the one hand, affected by neighbourhood and urban characteristics, and migration within or outside the urban area of upbringing on the other. By controlling for neighbourhood and urban qualities during upbringing, we can compare if remaining in the urban area of the parents with access to networks and parental assistance, or migration away from the area is more or less associated with upward social mobility. The neighbourhood literature (Van Ham, Hedman, Manley, Coulter, & Östh, 2014) suggests that ethnic minorities are more affected by the exposure to poverty during upbringing year. By separating minorities that migrate within or outside the urban area of upbringing, we can test if parental and local networks are more or less influential for social mobility.

In this paper, we assess intergenerational income mobility in Sweden using multilevel models. We differ from previous studies in two respects: first, we carry out our analysis at different geographical levels, using individual- and family-level data, as well as data generated for both neighbourhood and urban (municipality level) levels. Second, we conduct the analysis for three subpopulations. We track offspring from their parental residences to current residences and define two populations. Individuals who live in the same urban area as their parents are defined as immobile, and those who live in a different urban area represent the spatial mobile population. The third population consists of visible minorities (ethnic minorities).

Our results show that the migratory population shows significantly higher social mobility than the immobile population and that the intergenerational social links are weaker among visible minorities than the whole population. We observe substantial differences across municipalities, with higher mobility in big metropolitan areas like Malmö, Stockholm and Göteborg, and in areas close to major urban centres, especially northern parts of the country. Most of the socio-economic factors defined at the urban area level account for this heterogeneity, and our results about them provide new insights for policy-makers. For example, previous studies about intergenerational social mobility show a negative relationship between inequality and social mobility, implying that higher inequality is associated with lower intergenerational social mobility.

We show that our findings are robust to different specifications of the econometric models used in the study.

The remainder of the paper is as follows. Sections 2 presents the measures used to assess intergenerational income mobility. Section 3 describes the data. Section 4 presents the empirical strategy. Section 5 discusses our findings on income mobility in Sweden at the urban area (municipality) level. Section 6 concludes our findings and discusses the policy implications of our findings.

2 | MEASURES OF INTERGENERATIONAL INCOME MOBILITY

In this section, we present measures of intergenerational income mobility used in the literature. Intergenerational income mobility can be measured both in relative and absolute terms. Relative mobility depends on one's place in the income distribution. If a person's income puts him at the 70th percentile of the distribution and his parents were at the 40th at a comparable point in their lives, the relative mobility index indicates upward intergenerational mobility.

Absolute mobility refers to the degree to which individuals move up or down compared with their parents in absolute terms. If a person's inflation-adjusted income is higher than the income of her parents at a comparable point in life, the absolute mobility index indicates upward intergenerational mobility.

2.1 | Relative measures of intergenerational income mobility

Two measures of relative mobility are widely used in previous studies on intergenerational income mobility. The first measure is the elasticity of income between offspring and parents, known as intergenerational elasticity (IGE). It is estimated by regressing the log of the child's income on the log of parents' income. The slope parameter of the model quantifies the dependency of offspring's log outcomes on those of their parents. In formal terms:

$$y_c = \alpha + \beta y_p + \varepsilon \tag{1}$$

where y_c is the offspring's log income; y_p is the parental log income observed at similar ages of offspring; ε is the error term. The parameter β measures the IGE representing the fraction of income that is on average transmitted across generations (Moonen & van den Brakel, 2011). The higher the elasticity, the lower the income mobility.

The second measure of relative intergenerational income mobility is the rank–rank correlation measure, which makes use of relative positions of both offspring and parents in overall income distribution (Dahl & De Leire, 2008). First, both offspring and parents' incomes are ranked according to their relative position in the national income distribution, and ranks are scaled between 0 and 100. The conditional expectation of offspring's income rank, given the rank position of parents, is estimated as follows:

$$R_c = \alpha + \alpha_1 R_p + u \tag{2}$$

where R_c and R_p are income ranks of offspring and parents, respectively; α is the intercept term; and u is the error. The parameter α_1 is the rank–rank slope and measures the correlation between offspring and parents' positions in the income distribution. As pointed out by Mazumder (2015), rank-based measures, as the rank–rank slope, allow geographic comparisons, since ranks by geographical areas are all fixed to the national income distribution.

2.2 | Absolute measures of intergenerational income mobility

Measures of absolute mobility offer a different understanding of how much equal opportunities are provided to offspring with low-income family backgrounds. The first measure is called *absolute upward mobility* (Chetty, Hendren, Kline, & Saez, 2014), and it is defined as the expected income rank of a child with parents located at a given percentile in the parental income distribution. Typically, it is of interest to measure the average absolute mobility for children with parents whose income falls below the median of the national income distribution, and also the mean income rank of offspring whose parents are at percentile 25.

The second measure corresponds to the child's probability of rising from the bottom quantile to the top quintile of the income distribution (Chetty, Hendren, Kline, & Saez, 2014; Corak & Heisz, 1999; Hertz, 2006). It can be interpreted as the percentage of children reaching the highest quantile while their parents were in the first quantile. Chetty, Hendren, Kline, and Saez (2014) state that it is 'a measure of the fraction of children who achieve the "American Dream"' (Chetty, Hendren, Kline, & Saez, 2014 p. 7).

3 | DATA AND VARIABLES

We employ the PLACE longitudinal database. It provides detailed information about the demographic and socioeconomic characteristics of all residents in Sweden. We consider the 2014 wave, which is the latest available.

In contrast to studies where only the age of the offspring is known, we do in this case have the age of both parents. This is a benefit for the analysis, also implying a rise in the number of alternative model specifications. When analysing the link between two generations, we first consider the parent with the highest income. Then we repeat the analysis with the household income corrected for differences in household size and composition (Siermann, Van Teeffelen, & Urlings, 2004). A concern arises since parental income, especially that of the mother, could be endogenous to offspring's income. However, as pointed out by Heidrich (2017), since 1960, women were strongly encouraged to participate in the labour market owing to the expansion of both the public sector and public child care.

We calculate the multi-year average of both offspring and parental income in order to reduce the potential bias induced by transitory income fluctuations. According to Corak and Heisz (1999), the average should be calculated at least over 3 years, and 5 years is a time horizon long enough to reduce the bias. Some years later, Mazumder (2005) argued that averaging over 5 years still results in downward bias. To overcome these limitations, we consider offspring aged from 30 to 39 years in 2014 and average their income over 10 years. We consider parental income when parents were 30–39 years old. Overall, our sample is composed of more than 500,000 young individuals living in 290 Swedish municipalities to which the register data link to at least one known parent. This means that individuals whose parents are both deceased, or have not immigrated to Sweden, are excluded from the analyses. We concentrate on the biological link between parents and child, since knowledge about time spent in different households (if parents have been divorced) is limited. To compute the rank–rank correlation coefficient, we rank the offspring as well as the parent's income and normalize on a scale from 0 to 100, where 100 represents the richest segments of the society.

We consider the first group of variables characterizing individuals, such as gender, visible minority background, the completed field of study at the university, and the highest-earning parent's income rank. In some detail:

- Parental income is determined using disposable income data from the only known or both parents (criteria for inclusion of parents is described above) in years 1990 and 1991; the ranked and normalized maximum income values (spanning between 0 and 100) are used to indicate the parent's income. Disposable income is calculated using two similar methods differing between each parent and both parents. For each parent, the disposable income equals all income minus tax, child support and student loans. For both parents, the calculations also take into account potential union dissolvements by normalizing income by each household composition (controlling for the size, composition and income of each household)
- Gender is measured as a binary variable indicating whether the individual is *female* or not
- *Visible minority* is a binary variable indicating if the individual was born in Africa, Asia (excluding Russia) or Latin America. The variable is designed to capture potential discrimination
- *Migration distance* is the log Cartesian distance between the home of 1991 [registered residence of child and parent(s)] and the coordinates of residence of the child in 2014[1]
- Education is partitioned into ten different sub-groups based on professional specialization. The following categories are considered: *miscellaneous* (mostly general education on intermediate level), *pedagogy* (teacher training and other teaching related educations), *arts and humanities*, *social sciences* (wide range of professions with social scientific educations), *natural sciences* (biology, chemistry, physics, etc.), *tech and manufacturing* (wide range of jobs including engineering and IT), agrarian sectors (occupations oriented towards fisheries and farming), *health educations* (wide range of occupations including health-care, and pharmacy), *services* (occupations oriented towards tourism, hotel, restaurants, etc.) and, finally, *unknown* (often due to complex international migration events)

We also consider different aspects of cities that are expected to have a given relationship with the degree to which economic status is transmitted across generations. As mentioned in the introduction, there are three groups of variables that account for local economic conditions, human and social capital, respectively. Several studies also consider measures of income inequality in order to verify the existence of a Great Gatsby curve,[2] according to which there is a negative relationship between intergenerational social mobility and income inequality. In addition to a measure of income inequality, we consider other three variables measuring the distribution of monetary resources within the urban area (represented by municipality[3]): a measure of residential segregation by income that accounts for the spatial dimension of inequality; a measure of housing affordability; and a measure of poverty. The urban area-level variables are constructed by the information referring to 2014, when the offspring is at employable age.

The variables are defined as follows:

- *Business environment* is a measure for the business climate in Swedish municipalities annually delivered by the Confederation of Swedish Enterprise (Svenskt Näringsliv). The latter ranks Swedish municipalities according to

[1]If the parents are divorced, we use the coordinates assigned to the child (typically one of the parents). However, the factual location and/or time spent in different homes is not registered and subsequently not known.

[2]The Great Gatsby curve is a graph produced by Corak (2006, 2013a, 2016), and it became famous when Alan Krueger showed this graph in a speech, 'The Rise and Consequences of Inequality', to the Center for American Progress on 12 January 2012, in his capacity as the Chairman of the Council of Economic Advisors (Corak, 2013b).

[3]The Swedish administrative geography is centred around an urban core and surrounding rural areas, which means that the term municipality in most cases is synonymous with an urban area with surroundings.

their business climate on the basis of a broad range of sub-variables comprising factors such as local taxes, communications and skill-matching (Företagsklimat, 2013)

- *Economic diversification* is measured as the municipality's deviation from the national industrial mix in terms of the number of employees in the manufacturing, service and public sector
- *Log job accessibility* is based on potential accessibility to all jobs from the average residential coordinate in each municipality in Sweden. Accessibility is measured using an unconstrained Hansen (1959) approach
- *Educational attainment* is the percentage of aged 25+ years with a bachelor's degree
- *Voter participation* indicates the share of voting eligible who were participating in the national elections in 2014
- *Income equality* is the inverse Gini coefficient in each municipality. Gini is calculated using individual-level registers of disposable income cumulated at the municipality level. High values of income equality indicate that income is evenly distributed, while low values indicate the opposite
- *GSS14_100* is an individualized, and localized index of income segregation. It is a ratio between the Gini index computed among 100 nearest neighbours and the Gini index computed at the individual level for each municipality (see Türk & Östh, 2017). Using a *k*-nearest neighbour approach, the average disposable income among the 100 nearest neighbours (from a full population using all resident individuals in Sweden 2014) is computed. Then the inequality in the average income distribution among neighbourhoods is divided by individual-level income inequality within each municipality. Since both neighbourhood and individual level inequality is computed by the Gini index, GSS varies between 0 and 1. Higher values of the index indicate higher income segregation, where the maximum value 1 implies that neighbourhood income averages are identical to individual income levels, and that the 100 closest neighbours of each individual earn the same level of income
- *Regional affordability* is proxied by dividing the median disposable income at the municipality level by the average housing price for single-family homes, also at the municipality level. Resulting values are higher in municipalities with greater affordability
- *Not in poverty* is the percentage of population at the municipality level having a greater annual income than what is defined as the poverty line

Table 1 reports the municipality variables with their summary statistics weighted by the population, since the population count varies significantly between municipalities. With the exception of accessibility, educational attainment and GSS14_100 variables, all municipality-level variables have been normalized (*z*-score) on a municipality level (i.e., average score for each variable is zero in an $n = 290$ municipality data set).

4 | EMPIRICAL STRATEGY

Our empirical strategy first considers relative measures of social mobility as defined by models 1 and 2. We estimate the models by multilevel modelling approach. In the second step, we refine our empirical analysis to identify the resources and opportunities that are provided by cities and positively correlate with intergenerational income mobility. We expect statistically significant city fixed effects as shown by previous studies (Chetty, Hendren, Kline, & Saez, 2014; Michelangeli & Türk, 2021).

We adopt a multilevel framework and introduce the set of variables described in section 3 as the covariates in models 1 and 2. The advantage of the multilevel model is that it controls for the unobserved heterogeneity at the city level by a random intercept term. Such a model represents a parsimonious alternative to the ordinary least squares (OLS) regression with city dummy variables and avoids the inevitable multicollinearity between city dummy variables and city attributes.

In the multilevel model, individuals are considered as nested in municipalities, and the analysis is carried out at the individual level and municipality level, simultaneously. A common problem with observations nested within a higher level is that there may be a problem of spatial dependencies because individual outcomes

TABLE 1 Variables and descriptive at different levels of analysis of Swedish data

Level of analysis	Variable	Description	Mean or %	Std. dev.	Min	Max
1. Individual	Child ID	Over-time identifier	NA	NA	NA	NA
	Gender (female = 1)	Sex at birth	48.59%		0	1
	Visible minority background	Identify individuals as born in Africa, Asia or Latin America	4.77%		0	1
	Migration distance	Log-Cartesian distance (m) between residential coordinates as child and as adult	9.038	3.187	0	15.863
	Education:	Completed field of study at the university among the university graduates	100%		0	9
	Miscellaneous	Any other education	17.83%		0	0
	Pedagogy	Teacher training	7.36%		1	1
	Arts and humanities	Free arts and media-oriented education	7.22%		2	2
	Social sciences	University oriented, social sciences	16.02%		3	3
	Natural sciences	University oriented, natural sciences	3.26%		4	4
	Tech and manufacturing	Manufacture oriented education	20.63%		5	5
	Agrarian sectors	Farm or animal care-oriented educations	2.04%		6	6
	Health	Health-care educations	14.84%		7	7
	Services	Retail, tourism, etc., educations	7.32%		8	8
	Unknown	Unknown or no post-mandatory education	3.49%		9	9
	Parental income	The highest earning parent's income rank	50	28.871	0	100
2. Municipality	Municipality ID	Count 290 cities	NA	NA	114	2,584
	Economic diversification	Economic/sectoral diversification	−0.905	1.346	−3.918	2.191
	Log job accessibility	Gravity measure of job accessibility as socio-economic conditions in the municipality of residence	10.639	1.530	5.740	13.196
	Voter participation	Voter participation in national elections	0.13	0.893	−5.066	2.71
	Educational attainment	Share of aged 25+ years with a bachelor's degree	0.43	0.114	0.135	0.756
	Income equality	Spatial segregation by income	0.709	1.295	−2.271	4.57
	GSS14_100	Individualized neighbourhood indicator of income inequality (GINI)	0.324	0.134	0.096	0.773
	Regional affordability	Share of income used on housing cost	−0.682	0.626	−1.339	4.31
	Not in poverty	Share of population with an income above the poverty line	0.516	0.938	−1.888	4.377

Note: Source: PLACE data set.

(incomes) are likely to be similar in ways not fully accounted by the parental income in a single-level model. Multilevel models allow the spatial dependency of the residuals to be accommodated by differentiating between-individual errors from between-municipality errors, when the standard error estimates are biased (Snijders & Bosker, 1999). If the dependency is not taken into account, the results are deemed to be biased from a spatial autocorrelation perspective. A multilevel model of intergenerational income mobility can be defined as follows:

$$y_{cj} = \beta_0 + \beta_{pj} y_{pj} + u_j + \varepsilon_{cj} \tag{4}$$

Where y_{cj} is the log income (or income ranking) of offspring, who lives in city j; β_0 is the intercept and y_{pj} is the log income (or income ranking) of parents; u_j is city-specific errors; and ε_{cj} represents individual-level residuals. As explained above, β_{pj} measures intergenerational social mobility. Therefore, Equation 4 accounts both for intergenerational income elasticity (or rank–rank correlation coefficient) between parent and child, and heterogeneity among municipalities, simultaneously. Equation 4 can also be specified by including a random slope for the log income (or income ranking) of parents. In this way, β_{pj} is allowed to vary across municipalities.

Finally, we included in Equation 4 a set of municipality level fixed variables as follows:

$$y_{cj} = \beta_0 + \beta_{cj} x_{cj} + \beta_j x_j + u_j + \varepsilon_{cj} \tag{5}$$

Where y_{cj}, β_0, u_j and ε_{cj} are defined the same as in Equation 4; x_{cj} includes individual-level covariates such as gender and log of parental income (or income ranking) at location j, and finally, x_j is the set of municipality-level variables. The models are fit by maximum likelihood estimation, and the best linear unbiased predictors (BLUPs) are computed to predict municipality-level effects. BLUPs simultaneously estimate the variation for both the intercept and the estimated coefficients. This means that BLUPs take the systematic influences of municipalities into account as well as the fixed effects (in this case, intergenerational social mobility measures). For children living in different municipalities and whose parents earn the same income, the estimated figures represent the shrinkage values needed to adjust the income of the offspring (from the 'better' municipality) toward the mean.[4] Therefore, BLUPs represent municipality-level differences in income attainment of offspring whose parents earned the same income (or belong to the same income ranking).

We also measure absolute intergenerational social mobility by the following two methods:

As explained in section 2, we first measure the mean income rank of offspring whose parents are at percentile 25. After obtaining parameter estimates for each municipality, we measure the following formula, again, for each municipality separately.

$$\overline{\mathrm{r25c}} = \widehat{\beta_{\mathrm{i0}}} + \widehat{\beta_{\mathrm{i}}} 25$$

where $\overline{r25c}$ is the mean income rank of offspring whose parents were at percentile 25; $\widehat{\beta_{i0}}$ represents intercept; and $\widehat{\beta_i}25$ is rank–rank correlation coefficient evaluated at percentile 25. Both intercept and rank–rank correlation coefficient are municipality specific and estimated by rank–rank correlation measure in (5) by the multilevel model.

Finally, it is possible to compute the probability of upward mobility by a non-parametric measure. We determine the quintiles of the income distributions of both offspring and parents and calculate the share of offspring whose income is at the highest quintile and whose parents are at the lowest quintile for each municipality separately. Note that the quantiles are defined based on the national income distributions.

[4]Henderson (1963) shows that the best linear predictor (BLUP) of random effects satisfies $\hat{u} = GZ'V^{-1}\left(y - X\hat{\beta}\right)$ where X and Z represent fixed and random effects, G and V are variance matrices of u and y, and $\hat{\beta}$ is the weighted least square estimation.

5 | RESULTS

In this section, we discuss our findings by focusing our attention on the spatial influences in the process of intergenerational income mobility. The analyses start with a national account of intergenerational income mobility for different pairs of parents and their children. Table 2 summarizes the outputs from six different multilevel models, wherein children's income is analysed against the highest-earning parent in the household, father or mother, respectively, and also by IGE or the rank–rank slope. In general, we find high intergenerational social mobility in Sweden. Nonetheless, the results point out a stronger dependence between mothers and their children, and the weakest relationship is observed for father–offspring pairs. The IGE coefficient is estimated as 0.14 and represents the extent to which opportunities passed on to the new generation from the highest-earning parent. This measure is similar to Österberg's (2000) estimate of 0.13 between sons and fathers. Björklund, Lindahl and Plug (2006) instead estimate an IGE of 0.235 for the year 1999, which represents lower social mobility between fathers and children in Sweden. The reason might be the fact that our sample is relatively more recent compared with Björklund, Lindahl and Plug (2006), and most importantly, our multilevel modelling strategy explicitly caters for municipality/urban area differences and, therefore, locational influences. This means that a part of the variation in the distribution of income is explained by random part of the model, which results in lower test statistics compared with what typically used OLS models would have yielded. The estimated rank–rank correlation coefficients show that children's income ranks increase by 0.0764, 0.0715 and 0.0936 percentile points as a response to one percentile point increase in the highest-earning parents', father's and mother's income ranking, respectively. The results are also reported for parents and daughter–son pairs. We do not find substantial differences by gender. This finding again points to high social mobility in Sweden. Note that, for instance, Björklund, Roine and Waldenström (2012) show that intergenerational social mobility is very low between the top 0.1% income groups and sons, despite high mobility in the general population. They also discuss transmission mechanism for the top of the distribution, where IQ, non-cognitive skills and education of the offspring are insignificant when paired with the wealth of the father (see also Österberg, 2000). In our analysis, we do not analyse the mobility patterns for the top income earners. We think that, from an equal opportunity perspective, the opportunities that municipalities might offer would potentially have little or no effect on the top 0.1% income groups, which makes such an exercise less interesting for the present paper and is left for further studies.

The random intercept model summarized in Table 2 assumes that, for a given level of parental income, offspring might attain varying income levels if they lived in different municipalities, but the differences are constant across the distribution of parental income. We have also run a random slope multilevel model, which allows

TABLE 2 Social mobility measures for different pairs of parents and offspring, and income definition

Child's outcome	Coefficient (Std. error)	Coefficient (Std. error) daughter	Coefficient (Std. error) son
Log parents' income	0.1400*** (0.0027)	0.1400*** (0.0026)	0.1390*** (0.0027)
Log father's income	0.0971*** (0.0016)	0.0962 *** (0.0022)	0.1016*** (0.0023)
Log mother's income	0.1624*** (0.0020)	0.1641*** (0.0027)	0.1596*** (0.0029)
Parents' income rank	0.0764*** (0.0017)		
Father's income rank	0.0715*** (0.0013)	0.0754*** (0.0017)	0.0713*** (0.0018)
Mother's income rank	0.0936*** (0.0013)	0.0991*** (0.0017)	0.0894*** (0.0017)
Number of observations	551,814	285,038	269,318
Number of municipalities	290	290	290

Note: Each cell in this table reports the estimated coefficient with standard errors in parentheses from different multilevel models. The dependent variable is the child outcome; the explanatory variable is the parental income measure.

municipality lines to have different slopes. The results are reported in Table 3. The first column of Table 3 indicates that the random slope model estimates a slightly higher intergenerational social mobility. Meanwhile, the second column of the table shows that the variance in slopes is close to zero. Heidrich (2017) finds a similar result by estimating a multilevel model where the level-2 equation is the region instead of the municipality.

In what follows, we present the best linear unbiased predictors (BLUPs) for each multilevel model to identify the municipalities that offer better chances of upward mobility, when the higher-level effects are treated as random. Figure 1 displays the maps including random effects for relative measures of social mobility, wherein the first row shows the city effects in intergenerational social mobility between offspring and mother (first map) and offspring and father (second map). The second row includes two maps for the same pairs but with random effects derived from rank–rank correlations. In all maps, we observe similar rankings of cities in terms of their ability to promote better economic attainment. Big metropolitan areas like Malmö, Stockholm and Göteborg, and areas in proximity to major urban centres generate the greater push for upward mobility, and there is a positive correlation between city attributes and earnings of residents. Northern parts of the country also exhibit high values, as these are locations where the mining sector is developed, and earnings are generally high compared with other regions. As a result, overall maps illustrate a degree of heterogeneity in social mobility in different parts of the country. The present paper aims to examine these differences by the set of municipality-specific variables as described in the data section. Nevertheless, first, we test whether the city-level random effects and the rankings among them are robust if we change the model specification. In particular, we repeat our analyses of intergenerational income mobility by a non-parametric approach similar to that of Chetty, Hendren, Kline and Saez, 2014 and for each municipality. The alternative analyses are conducted by first computing the mean income rank of offspring whose mother or father had an income level which was below the median of the income distribution. Then we also compute the probability of offspring to reach the top quintile of the national income distribution, while their parents were in the bottom quintile. This is done by identifying the quintile position of children and their families in the national income distribution of their respective generations and creating a quintile transition matrix for offspring–father and offspring–mother pairs. The practice allows us to identify the share of offspring who reached the top quintile, departing from families at the bottom quintile. Both of the measures are carried out for each municipality separately. Figure 2 summarizes the results, where the first row shows that the mean income rank of offspring with a parent below median income varies between 31 and 65 percentile points. The second row indicates that the share of (or probability to reach the top quintile) offspring who experienced a jump from the bottom quintile families to the top differs significantly across municipalities and varies between 0% and 42%. These findings, too, point out a degree of heterogeneity among Swedish municipalities in intergenerational income mobility. Moreover, comparing the maps displayed in Figures 1 and 2, we observe the same ranking among municipalities. This means that the BLUPs from multilevel models are robust predictors of

TABLE 3 Random slope model: social mobility measures for different pairs of parents and offspring, and income definition

Child's outcome	Coefficient (Std. error)	Variance in slopes between municipalities (Std. error)
Log father's income	0.0867*** (0.0018)	0.00005 (0.0000)
Log mother's income	0.1527*** (0.0022)	0.00005 (0.0000)
Father's income rank	0.0484*** (0.0026)	0.0009 (0.0001)
Mother's income rank	0.0733*** (0.0025)	0.0008 (0.0001)
Number of observations	551,814	551,814
Number of municipalities	290	290

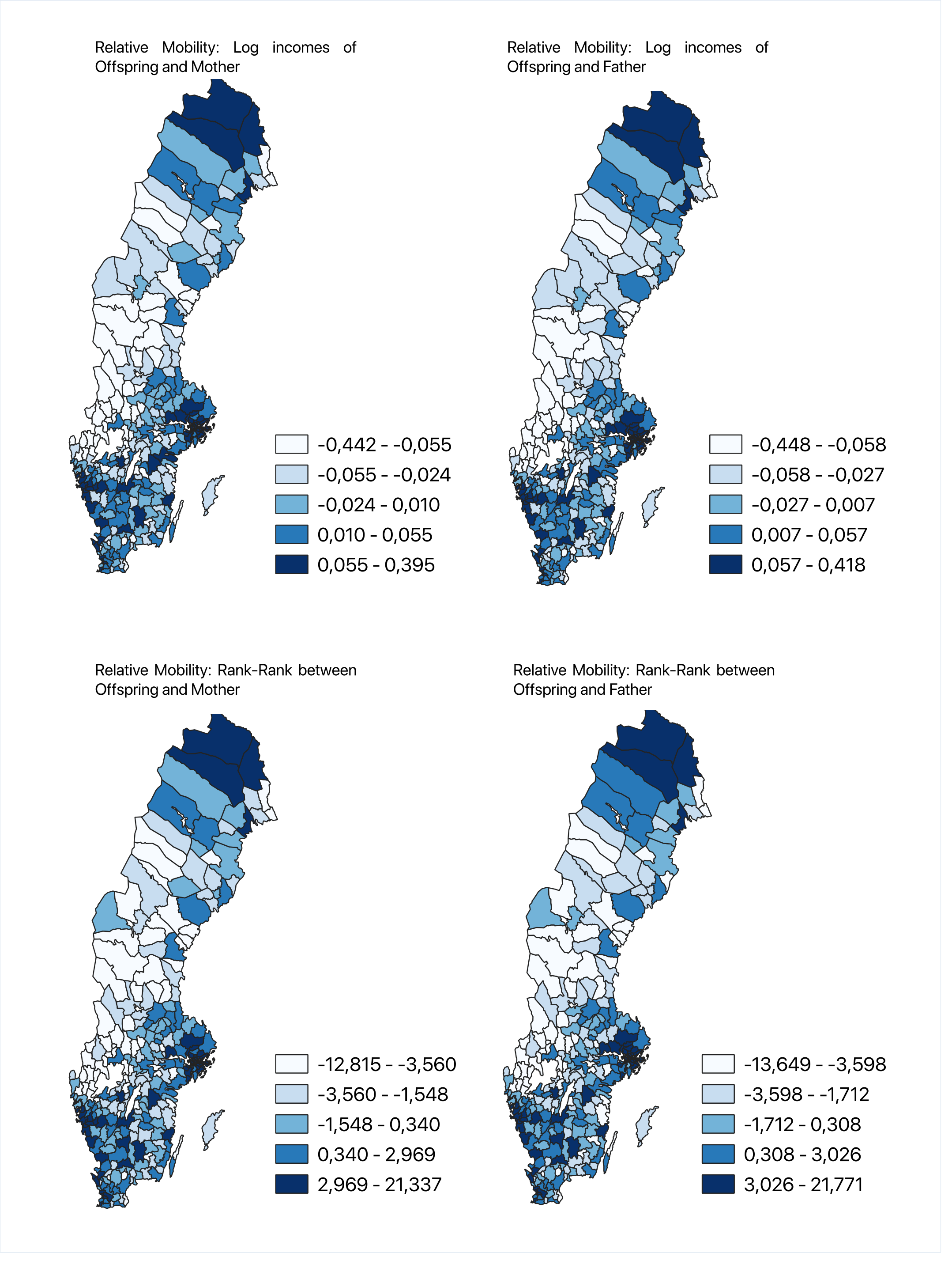

FIGURE 1 Relative measures of intergenerational social mobility, heterogeneity among municipalities. Coloration indicates values that fall between the indicated values

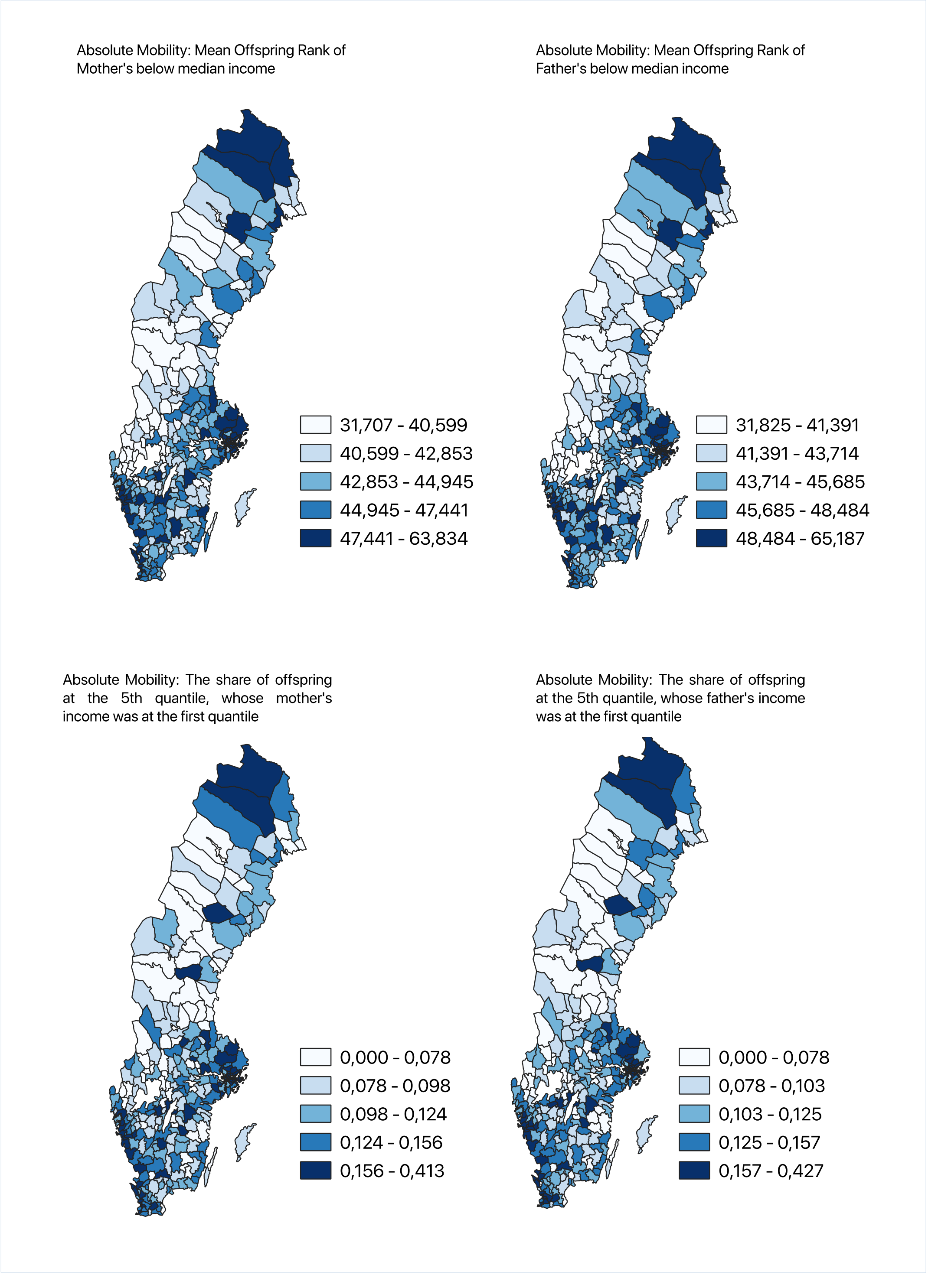

FIGURE 2 Absolute measures of intergenerational social mobility, heterogeneity across municipalities. Coloration indicates values that fall between the indicated values

municipality effects and that we can conduct the following analyses to examine the dynamics behind the observed spatial heterogeneity by the multilevel model described in Equation 5.

Appendix Table A1 also points out a strong correlation between BLUPs and non-parametric measures of municipality effects. In addition to offspring–mother or father pairs, Table A1 includes offspring and the highest-earning parent as the background variable. All specifications are highly correlated with each other. In Figure A1, we have also reported the maps of the predictions of intergenerational social mobility coefficients from random slopes models. These maps show a degree of variability in the random slopes, confirming that there are municipality-level effects on income mobility. We also note that Figure 1, Figure 2 and Figure A1, estimated using different models and approaches, show very similar patterns for social mobility across municipalities. This means that our results regarding the heterogeneity in social mobility across municipalities are robust for different model specifications.

We could also extend the analysis of absolute mobility to identify the main determinants of absolute mobility in Swedish municipalities following the approach suggested by Liss, Korpi and Wennberg (2019). They use decomposition techniques to determine the contribution of the three main explanatory factors to the measured absolute mobility for Sweden: growth (average earning growth), income dispersion (income inequality) and exchange (relative income mobility). Although it is a very interesting issue to address, such an investigation is clearly beyond the scope of the present paper.

In the following analyses, we specify a multilevel model with offspring's income rank as the dependent variable, and both additional first-level covariates and a set of second-level variables. We use rank–rank correlation analysis as the benchmark model since percentile ranks are more robust predictors of economic status across years and among locations, which allows us to conduct comparative investigations. The similarity between the outputs from different models in estimating municipality/urban level effects also gives us a degree of freedom to choose the final model specification. The final model is conducted for three populations: the immobile population includes individuals who have lived in the same municipality for more than 15 years, and the spatial mobile population is defined otherwise; the third population consists of visible minorities.

The final model includes gender, visible minority background (for spatial mobile and immobile populations), the completed field of study at the university, and the highest-earning parent's income rank as individual-level variables. To account for the mobility both for spatial mobile and immobile populations, we define the distance from the parental house to the current location as an independent variable. At the second level, we introduce economic/sectoral diversification, business environment, a gravity measure of job accessibility as socio-economic conditions in the municipality of residence, the share of highly educated individuals, voter participation at local elections, the share of the population who escaped from the poverty status, regional affordability, and spatial segregation by income. Table 4 presents the outputs from the multilevel models. The results point to lower social mobility for the spatial immobile population. The coefficient of the parental income rank is 0.079, which is higher than the results shown in the fifth row of Table 2. The highest intergenerational social mobility is computed for individuals who belong to visible minorities (VMs). This means that the association between the earnings of generations is lower among VMs than the entire population in Sweden. Previous studies have documented different trends in various countries (see Platt, 2005, for Britain). For instance, Aydemir, Chen and Corak (2009) show that, in Canada, intergenerational social mobility is similar between the whole population and immigrants, but greater than it is in the United States. Even though VMs experience higher mobility, they are generally disadvantaged, as indicated by the coefficients of the variable VM model 1 and 2, where belonging to the VM population is associated with around nine percentage points decrease in adult income ranks. The results also show that gender is a significant determinant of earnings and that the effect varies between the three populations. Females have almost 16 percentage points fewer income rankings than men in the immobile population and around 12 percentage points in the spatial mobile population and VMs. That spatially mobile women have higher chances of social mobility compared with spatially immobile population can be explained by moving-to-opportunity behaviour. The variable distance to the parental house especially supports this. The coefficients suggest that the residential separation between adult children and their parents is associated

TABLE 4 Multilevel models of rank–rank correlation coefficient analysis. Model 1 represents immobile population, model 2 mobile, and model 3 visible minorities

	Model 1	Model 2	Model 3
	Coeff. (std. error)	Coeff. (std. error)	Coeff. (std. error)
Parental income ranking	0.079*** (0.002)	0.063*** (0.002)	0.048*** (0.007)
Visible minorities	−9.248*** (0.320)	−9.424*** (0.303)	
Female	−15.757*** (0.121)	−12.104*** (0.115)	−11.501*** (0.427)
Field of study (reference: not completed)			
Pedagogy	2.246*** (0.239)	1.878*** (0.233)	7.030*** (1.006)
Arts and humanities	−0.282 (0.240)	−2.330*** (0.228)	2.182** (0.081)
Social sciences	8.703*** (0.187)	10.625*** (0.082)	11.525*** (0.593)
Natural sciences	6.468*** (0.354)	7.779*** (0.294)	10.899*** (1.131)
Tech and manufacturing	9.619*** (0.168)	12.416*** (0.182)	13.369*** (0.822)
Agrarian sectors	5.130*** (0.373)	5.797*** (0.400)	11.641*** (6.028)
Health	1.787*** (0.188)	2.928*** (0.198)	9.221*** (0.641)
Services	5.191*** (0.223)	6.781*** (0.238)	7.969*** (1.017)
Unknown	1.350*** (0.275)	1.992*** (.356)	0.549 (1.088)
Log distance to parental house	0.924*** (0.055)	0.388*** (0.038)	0.703*** (0.022)
Municipality-specific effects			
Economic diversification	0.042 (0.197)	−0.573 (0.212)	−0.826 (0.508)
Business environment	0.049 (0.178)	−0.144 (0.194)	−0.748 (0.536)
Job accessibility	0.437** (0.220)	1.416*** (0.243)	1.349** (0.243)
Educational attainment	0.065 (0.255)	1.094*** (0.281)	1.406** (0.626)
Voter participation	−0.515** (0.209)	−1.018*** (0.243)	−1.425 (0.756)
Income segregation	10.944*** (2.840)	7.349*** (3.064)	−1.992 (7.082)
Income equality	−0.537** (0.233)	−0.629** (0.259)	−1.098 (0.675)
Regional affordability	0.859*** (0.237)	−0.265 (0.296)	0.327 (1.222)
Out of poverty	3.277*** (0.339)	3.214*** (0.367)	4.201*** (0.820)
Var (municipality level)	0.000478 (0.00009)	0.000461 (0.00006)	0.00046 (0.00008)
Var (residual)	0.250789 (0.00071)	0.24263 (0.00045)	0.235386 (0.00068)
Observations	238,199	251,041	19,896
Log likelihood	−1,110,906.7	−1,176,747.9	−94,213.565
Number of groups	239	290	256

with higher earnings. Even in the same municipality, living farther from parents shows the same positive relationship with income. One explanation of the finding is that children move to locations with better labour markets and opportunities. On the other hand, the stickiness between generations might lessen due to new networks built while living farther from parents.

As for educational attainment, any degree is associated with higher earnings except arts and humanities for the mobile and immobile populations. Meanwhile, all degrees show positive effects for VMs, as shown in model 3. Arts and humanities make an unusual case because individuals who complete these degrees are worse off than not completing any degree both for spatially mobile and immobile population, but the opposite is observed for VMs.

Turning to municipality-specific variables, the overall level of human capital in the municipality, measured by the percentage of highly educated adults, positively correlates with social mobility.

Among economic variables, three of them provide information on income resources. Higher shares of the population who are not in poverty are positively associated with social mobility, and the relationship is stronger for VMs. On the other hand, income equality negatively correlates with social mobility for spatially mobile and immobile populations, while the correlation is not statistically significant for VMs. The third variable accounts for the spatial distribution of inequality within the municipality. The positive and significant estimated coefficients for spatially mobile and immobile people indicate that, anything else being equal, social mobility is higher in cities where the most significant disparities are between neighbourhoods. In contrast, the distribution of income within each neighbourhood is quite low. Higher similarity among neighbours (income-wise) works in favour of better income attainment. This could be due to sorting behaviour. Individuals sort into neighbourhoods that reflect their income status. However, if we look to model 3 for VMs, the association between social mobility and income segregation is not statistically significant. This is because VMs sort more on the basis of nationality rather than income.[5]

Regional affordability positively correlates with social mobility only for the immobile population. Perhaps this result reflects the general economic sustainability of housing costs at the municipality level that play a decisive role in enhancing social mobility in more stable societies.

Other economic indicators, such as business environment and economic diversity, do not exhibit a statistically significant association with social mobility. Job accessibility is positively associated with social mobility. The political participation of younger generations negatively correlates with social mobility for spatial mobile and immobile populations, while it does not matter for VMs. This result is consistent with relatively recent studies on Sweden and other European countries according to which younger generations are less interested in politics owing to a feeling of political apathy and alienation. The former implies that citizens are generally less interested in politics. The latter admits the possibility that they can be interested, but they are de facto estranged from the formal political system for some reason (see Górecki, 2013; Valgarðsson, 2019 and references therein).

6 | CONCLUSION

The present paper has aimed to investigate intergenerational income mobility in Sweden using recent data from PLACE, providing detailed information about the demographic and socio-economic characteristics of all residents in Sweden. In addition to individual and household variables, we have modelled a variety of city resources and characteristics that have been assumed to account for differences in social mobility observed across Swedish municipalities. We have also considered different groups of population on the basis of mobility and minority status. The results have shown that social mobility differs across municipalities and groups. In particular, we find significantly higher social mobility for individuals who live in municipalities other than their parents.

Similarly, the increased social mobility is associated with the distance from the parental house even in the same urban area (municipality). Earlier studies have suggested that the propensity to move or stay is determined by the degree of ties to other people, places or life projects (Fischer & Malmberg, 2001). This may mean that there is a trade-off between staying and remaining connected, and moving from both a physical and social perspective. Additionally, we find that visible minorities experience higher intergenerational social mobility than the whole population. As for the geographical variation, northern parts of the country, big metropolitan areas like Malmö, Stockholm and Göteborg, and areas in proximity to major urban centres exhibit high values of social mobility. The common traits of these areas are a greater human capital, more residential segregation by income, more local income inequality, and greater accessibility to jobs.

[5]Several studies provide evidence that immigrants tend to live in neighbourhoods where others from the same origin live (see, for example, Saiz & Wachter, 2011).

Our results lead us to argue, as Chetty, Hendren, Kline and Saez (2014) did for the United States, that intergenerational mobility is a local issue that public governments can address with tailor-made policies. Usually, policies promoting intergenerational social mobility tend to favour a more even availability of economic resources to equalize opportunities and life chances in the spirit of Massey and Denton (1996). Our findings show that, controlling for poverty, a degree of inequality within a city may provide a powerful incentive to upward mobility.

Our study could be extended to seek the mechanisms behind some of our results. For example, we found that social mobility seems to be higher for geographically mobile individuals. One could wonder what kind of reason leads people to be geographically mobile or immobile and how could they be connected with social mobility.[6] A possible answer could be provided by a utility maximizing framework, in which rational and freely mobile individuals move only if the utility associated with a destination location is not lower than the expected utility associated with the origin location plus the cost of relocating. The choice to move is expected to be affected by the opportunity to climb the social ladder. Viewed from an opportunity perspective, the results are compelling and interesting in that moving in fact often means moving upwards also socially. This means that career-building is less dependent on the network of parents and more a result of the individual choice to move, and since the pattern generally remains the same also for men and women as well as for children of different ethical background, there is support for a depiction of the Swedish system as relatively egalitarian and urban oriented. There are, however, dark clouds on the sky that deserves the attention of policy-makers. Areas with a net positive migration rate are not only seeing increasing costs of housing (Tyrcha, 2020) but a negative effect on the net income in more populous areas (Korpi et al., 2011). These effects are not only causing strong sorting effects on the housing market but are also negatively affecting the possibility to migrate and find affordable housing for particularly young migrants (Lieberg, 2013; Malmberg & Clark, 2020). Around 50% of the new construction of multi-family residential in Sweden are rentals, but since the construction rate is low house pricing and housing queue times are long (on average, 9 years of queueing is needed to get a rental apartment in the greater Stockholm area and 16 years in the central parts), migration to the larger urban areas risks becoming an influential obstacle for social mobility (Bostad Stockholm, 2021; Byggföretagen, 2021). Means to facilitate migration between regions should therefore be of great interest to policy-makers where the key question to address is the construction of affordable housing in areas that are characterized by large in-migration flows, or possibly better described as wherever an option to migration is at risk of being turned down due to shortages in housing alternatives at the destination. The consequences of failing to provide affordable housing may be more profound than just limiting social mobility. The founders of the IT company Spotify (Daniel Ek and Martin Lorentzon) published an open letter already in 2016 in which they indicated that the company was planning to increase the new recruitment of personnel outside Sweden since the company found it increasingly difficult to find rental housing in the metropolitan regions. The problem of finding affordable accommodation is already believed to have reduced the economic growth potential in the capital region for many years (Expressen, 2014; Fastighetsnytt, 2014); and although policy can alleviate some of the housing shortage problems, the main issue is more of a political conundrum than a policy-related question to solve. Housing politics are highly polarized political questions in Sweden, and also unlikely to be easily solved. A housing/rental-related political debate even caused (21 June 2021) the fall of the current/recent Swedish government (see, for instance, The Local, 2021).[7] The dividing line is how to regulate tenant costs in rental housing, and until this question is resolved, the housing shortage is likely to persist.

[6]We thank one of the anonymous reviewers for this remark.

[7]The left (Vänsterpartiet) gave the prime minister a moratorium to cancel a petition on market rents or withdraw its support for the centre/social democratic coalition – the moratorium was not met. This encouraged the right-wing party Sverigedemokraterna to call for a no-confidence vote in the parliament, which after a vote led to the fall of the government on 21 June 2021. At the point of writing, there has been no political solution.

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APPENDIX A

TABLE A1 Correlation analysis between different BLUPs and non-parametric measures of municipality effects in intergenerational income mobility

	Random effects offspring–father log income	Random effects offspring–father rank–rank	Random effects offspring–mother log income	Random effects offspring–mother rank–rank	First absolute offspring–both parents
Random effects offspring–father log income	1.000				
Random effects offspring–father rank–rank	0.979	1.000			
Random effects offspring–mother log income	0.996	0.974	1.000		
Random effects offspring–mother rank–rank	0.974	0.996	0.976	1.000	
First absolute offspring–both parents	0.925	0.943	0.926	0.945	1.000
First absolute offspring–both or either	0.954	0.975	0.951	0.973	0.970
First absolute offspring–father	0.954	0.976	0.950	0.973	0.969
First absolute offspring–mother	0.948	0.972	0.949	0.974	0.963
Second absolute offspring–both parents	0.696	0.738	0.704	0.752	0.753
Second absolute offspring–father	0.809	0.856	0.811	0.863	0.835
Second absolute offspring–mother	0.794	0.845	0.797	0.854	0.817

TABLE A1 Continued

	First absolute offspring–both or either	First absolute offspring–father	First absolute offspring–mother	Second absolute offspring–both parents	Second absolute offspring–father	Second absolute offspring–mother
Random effects offspring–father log income						
Random effects offspring–father rank–rank						
Random effects offspring–mother log income						
Random effects offspring–mother rank–rank						
First absolute offspring–both parents						
First absolute offspring–both or either	1.000					
First absolute offspring–father	0.994	1.000				
First absolute offspring–mother	0.989	0.983	1.000			
Second absolute offspring–both parents	0.751	0.752	0.769	1.000		
Second absolute offspring–father	0.858	0.863	0.863	0.904	1.000	
Second absolute offspring–mother	0.841	0.841	0.856	0.899	0.962	1.000

TABLE A2 Sensitivity analysis: multilevel regression of intergenerational social mobility without income segregation and poverty variables

	Model 1
	Coeff. (std. error)
Parental income ranking	0.067*** (0.001)
Visible minorities	−10.239*** (0.194)
Female	−14.070*** (0.077)
Field of study (reference: not completed)	
Pedagogy	2.233*** (0.153)
Arts and humanities	−1.280*** (0.153)
Social sciences	10.042*** (0.121)
Natural sciences	7.342*** (0.209)
Tech and manufacturing	11.330*** (0.114)
Agrarian sectors	5.464*** (0.252)
Health	2.458*** (0.126)
Services	6.159*** (0.151)
Unknown	2.011*** (0.203)
Log distance to parental house	0.672*** (0.013)
Municipality-specific effects	
Economic diversification	−1.056*** (0.189)
Business environment	−0.020 (0.181)
Job accessibility	1.870*** (0.224)
Educational attainment	2.155*** (0.235)
Voter participation	−0.515** (0.209)
Income equality	−1.327*** (0.192)
Regional affordability	0.637*** (0.249)
Var (municipality level)	4.734 (0.467)
Var (residual)	676.066 (1.268)
Observations	568,750
Log likelihood	−2,660,401.5
Number of groups	290

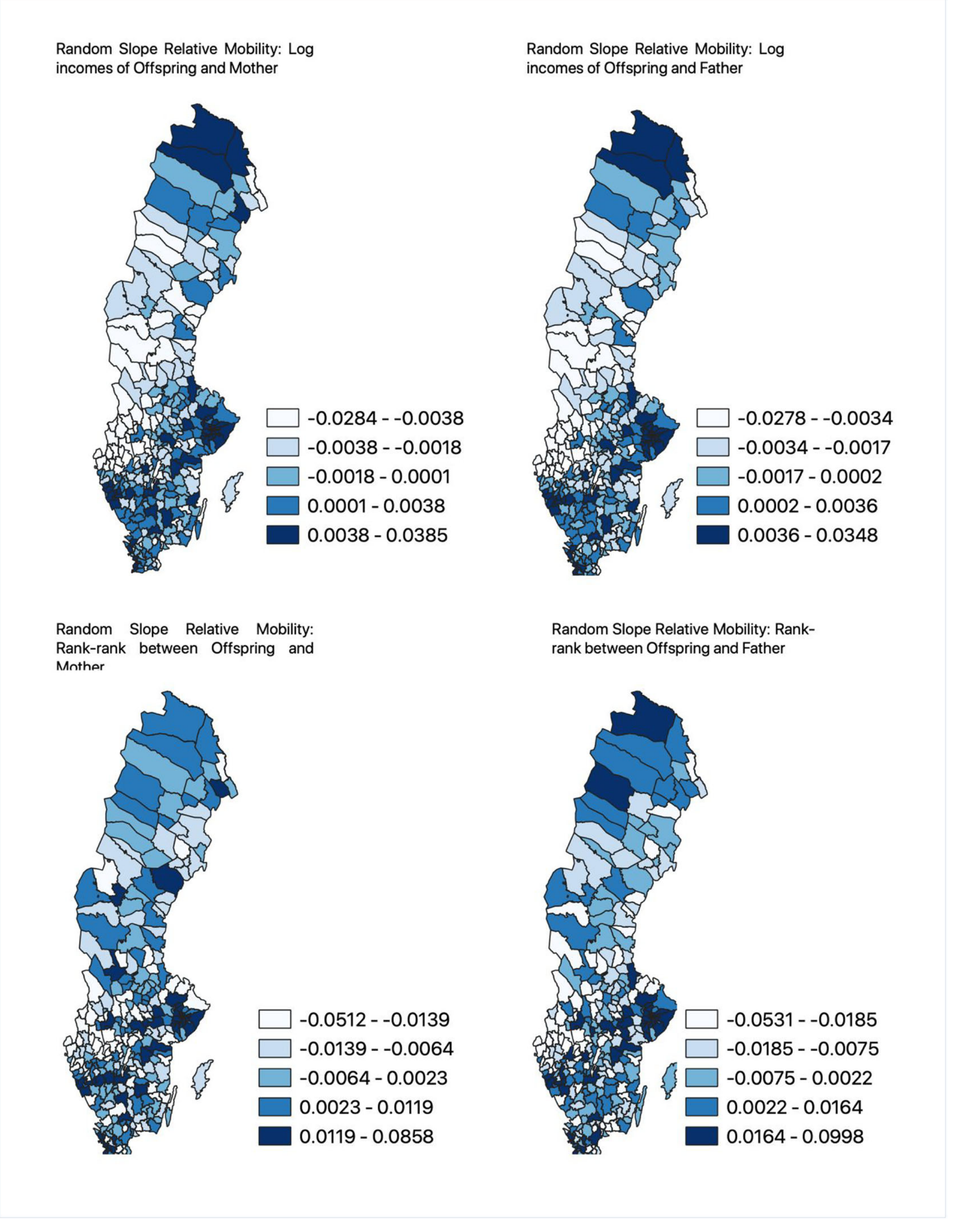

FIGURE A1 Municipality random effects predicted from the outputs of the random slope multilevel models. Coloration indicates values that fall between the indicated values